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NOTES ON PROPAGATION OF RARE NEW ENGLAND SPECIES

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ABSTRACT

Propagation and cultivation of endangered species can provide information on species biology, provide reserve collections in the event of catastrophe in the wild, educate the public at botanical institutions, and provide plants for reintroduction or introduction to the wild. Propagation notes on New England rare species include *Eupatorium leucolepis* var. *novae-angliae, Trollius laxus, Oxytropis campestris* var. *johannensis, Schwalbea americana, Agalinis acuta, Astragalis robbinsii* var. *jesupi, Polemonium van-bruntiae, Mimulus ringens* var. *colpolphilus,* and *Scirpus longii.*

Key Words: *Eupatorium leucolepis* var. *novae-angliae, Trollius laxus, Oxytropis campestris* var. *johannensis, Schwalbea americana, Agalinis acuta, Astragalis robbinsii* var. *jesupi, Polemonium van-bruntiae, Mimulus ringens* var. *colpolphilus, Scirpus longii,* propagation, endangered species, New England

INTRODUCTION

Since the publication of lists of rare and endangered species for each of the New England states (Church and Champlin, 1978; Coddington and Field, 1978; Countryman, 1978; Eastman, 1978; Mehrhoff, 1978; Storks and Crow, 1978) and for New England as a region (Crow et al., 1981) there has been increased interest in the cultivation and propagation of endangered plants. Rare plant propagation is useful for several reasons:

1. Propagation research can provide important information on species biology. Although not all *ex-situ* research may be directly applicable to wild populations, most physiological characteristics of plants in cultivation are the same as far as we know (Raven, 1979). Furthermore, if propagation material is taken directly from wild populations, the research may provide immediate information on the behavior of the species in the wild. However, more often than not, this research will raise more questions about the behavior of wild populations. For example, if seed collected from a wild population germinates with relative ease in cultivation, and there is a scarcity of young plants in the wild, researchers may wish to focus on seedling establishment in field research.
2. Propagation provides reserve collections in the event of catastrophe in the wild. These collections are likely to be genetically

different from the wild populations for a variety of reasons (Brumback, 1981), but they nevertheless provide material as a reserve if wild populations are destroyed. There are a number of species now in cultivation that no longer exist in the wild, including *Franklinia alatamaha* (Ayensu and DeFilipps, 1978).

The recent initiation of seed banks and reserve collections at botanic gardens throughout the U.S. through the Center for Plant Conservation (CPC) (Jamaica Plain, MA) is part of a plan to provide that all the endangered plants of a region be part of a national reserve collection. These reserve collections can also provide research material to other researchers so that the need to further collect from already dwindling wild populations is obviated.

3. Rare plant propagation provides specimens to botanical gardens and universities so that the public will become aware of the beauty of (and the issues surrounding) our endangered species. Furthermore, these display collections can relieve pressure on wild populations by providing viewing sites for plants whose wild populations might be damaged by repeated visits by plant enthusiasts.

4. Propagation provides plants for introduction or re-introduction should this action be deemed advisable by wildlife managers. Successful reintroduction has already been achieved in a number of areas including Oregon (CPC, 1987, 1988). It appears inevitable that the current pace of development will necessitate more reintroduction of rare plants.

Propagation and cultivation of some plant groups, especially terrestrial orchids and semi-parasites of the Scrophulariaceae, is notoriously difficult. However, many other species, when removed from competition in the wild, thrive in cultivation. In propagating any endangered plant, it is advisable to discuss methods with horticulturists from other parts of the country. It may be that the species is not rare in another area and propagation information is sometimes available.

The general approach used in cultivating and propagating plants at the Garden in the Woods (GITW), the botanical garden of the New England Wild Flower Society, has been to attempt to match the natural conditions found in the wild, and when possible, to allow natural processes (i.e., winter freezing and thawing) to stimulate germination of seed.

When dealing with wild-collected rare plant seeds, it is important that collection from the wild should not adversely affect the population in any way. Therefore, only small numbers of seeds of rare plants are usually available for germination testing, and thus, these tests may not contain a statistically valid number of seeds. For the same reason, replication of trials is often not possible.

METHODS

Unless otherwise noted, the following methods were used. Seeds were sown on a moistened mix of Rediearth (commercially available peat-lite germination medium), peat moss, and coarse concrete sand in Pen Packs (plastic containers 6 × 3 × 5 inches). After sowing, seeds were either covered lightly with sand or allowed to remain uncovered in full light. All seeds not covered had glass or plastic placed on top of the flat in order to conserve moisture until germination was complete. In order to avoid disturbing seeds as they germinated, flats without sand covering were watered from below by immersing the flat ½ of its depth in water until the surface was moist. Flats that were covered with sand after sowing were watered gently from above. After sowing, flats were moistened and either 1) placed outside under natural conditions, 2) remained in the Solar Greenhouse (SGH) at a minimum night temperature of 55°F, or 3) were enclosed in a plastic bag and placed in a refrigerator for several months at 35–40°F.

Softwood cuttings were taken from the tips of stems and were approximately 1–2 inches long. The cuttings were moistened, the ends were dipped in Hormoroot A (active rooting hormone .01% indolebutyric acid), and stuck in coarse concrete sand under intermittent mist (Geiger Mist-a-matic) without bottom heat. Temperatures in the solar greenhouse after June 1 are at least 80°F during the day.

The mixtures used to pot seedlings or cuttings varied with the species, but basically all mixtures made use of our regular potting soil combined with sand to increase drainage and peat moss to increase acidity where appropriate. Our regular soil consists of a combination of compost, peat moss, perlite, sand, and dehydrated cow manure to produce a mixture that retains moisture, yet is well-drained. Containers held outside over winter are covered with ¼-inch Microfoam (a commercially-available thermal blan-

ket) and white polyethylene plastic. The containers freeze over winter, but roots and buds are not normally damaged. The protection mitigates heaving of small plants or seeds due to freezing and thawing.

NOTES ON NEW ENGLAND RARE SPECIES

The following species, with the exception of *Polemonium vanbruntiae,* were listed as Threatened and Endangered Plant Species Considered for Federal Listing which occur in New England in Crow et al. (1981).

Eupatorium leucolepis (DC.) T. & G. var. *novae-angliae* Fern.

Softwood cuttings taken in summer rooted easily. Seeds collected from the wild on Sept. 12, 1984 (Prop. #84p-554) and sown onto a flat outside germinated in May, 1985. Seed collected from plants growing at the Garden in the Woods on Oct. 5 and 7, 1985 was dried at room temperature and stored under refrigeration (38°F) until sowing April 4, 1985 (Prop. #85p-247). Seed was divided into two groups. Group A was placed outside immediately after sowing and Group B was enclosed in a plastic bag and placed in a refrigerator until June 28, 1985 when the flat was placed outside. Group A germinated in May, 1985 approximately 1 month after sowing. Group B germinated on July 14, 1985. By September, 1985 both groups of seedlings had grown significantly and were in bloom in the seed flats.

This species appears easy to propagate from both seeds and cuttings. Seed germination may be slightly better if seeds are given a pretreatment of cold (either dry or moist cold), but as in many members of the Asteraceae (Young and Young, 1986), seed will germinate without pretreatment.

Trollius laxus Salisb.

This species has been present at the Garden in the Woods (GITW) since 1940 and seed germination has been traditionally strong. Seed sown outside one month after collection (late May and early June) from the population at GITW did not germinate until the following spring (30% germination—50 seeds sown). Seed sown at the same time into a seed flat and placed in a

refrigerator for three months germinated within two weeks after being removed from the refrigerator and placed in the SGH. Seed from this same collection that had been stored dry in a refrigerator for nine months failed to germinate when sown outside in March. However, this flat remained outside for the summer and was given protection overwinter in a cold frame. Germination of this seed was near 100% in the spring. In repeated collections for commercial production of this species at GITW, seed collected in early June, allowed to dry at room temperature for several months, then stored dry in a refrigerator until sowing outside in November has germinated well each spring.

This species is relatively easy to grow from seed. Parsons and Yates (1984) have shown that seedlings grow better in calcareous soil than in acid soil and seed benefits from a warm, moist period before being subjected to a cold, moist period. Although this warm, moist period does not appear always necessary to successful production of *Trollius laxus* in our tests, sowing the seed immediately after ripening and allowing the seeds to achieve a warm, moist period after ripening outside over summer may produce better germination. A period of moist cold is necessary in any event. Seed sown in fall typically produces blooming size plants during the second growing season after germination.

Oxytropis campestris DC. var. *johannensis* Fern.

Seed collected August 6, 1986 in the wild and sown two days later (50 seeds—Prop. #86p-538) resulted in 3 seedlings within 3 weeks of sowing. At the same time, seed was sown onto a flat and placed in a refrigerator for 3 months of moist cold. Upon returning to a warm greenhouse, 6 seedlings had germinated by May of 1987. Seed from the same collection in August of 1986 was allowed to dry and was stored in a refrigerator from one week after collection until sowing on April 7, 1987. Seed was divided into two groups of 50 seeds (Prop. #87p-421). Group A, sown outside, germinated within 3 weeks of sowing and resulted in 13 seedlings. Group B, sown and placed in the refrigerator for 2 months before being placed outside, germinated very strongly, but no exact number was counted. Likewise, seed held dry in a refrigerator from one week after collection, and sowed outside Nov. 12, 1987 germinated very strongly in spring 1988 (no count of seedlings made).

It is apparent that seed of this species will germinate without

a period of moist cold, but dry, cool storage of seed followed by moist refrigeration or outdoor temperatures through winter may give better germination. This plant is reputedly short-lived in cultivation (Dr. George Newman, Bedford, NH, pers. comm.). The plants bloomed in cultivation during the second year of growth following germination.

Schwalbea americana L.

Seed collected in November in the wild (Prop. #82p-478) sown immediately in a warm greenhouse (SGH) germinated slightly by January. However, seed sown outside at the same time and allowed to remain outside all winter produced far better germination in the spring. Seed that was not covered with sand after sowing had obviously better germination in both instances. Repeated attempts at germination since this 1982 test have resulted in either no germination or only one or two seedlings. All seedlings have eventually died. This species is a member of the Scrophulariaceae, and appears to be semi-parasitic, at least in the seedling stage. Other growers have reported (George Newman, Bedford, NH, pers. comm.) that seeds germinated, but that all seedlings eventually die.

Musselman and Mann (1978) grew this species from seed by sowing seed directly into pots containing 1-year-old tree species. They reported haustoria (root attachment) to 16 of 19 tree species tested. It appears that many semi-parasites form haustoria on widely varied hosts, and thus may not be host-specific. Experiments are underway to test the germination and growth of *Schwalbea* when sown with various native grass species.

Agalinis acuta Pennell

Seed received in October, 1983 (Prop. #83p-519) and sown under grow lights (no sand cover) germinated without cold treatment. Other seed sown outside in November, 1983 germinated in spring 1984 and bloomed slightly by September, 1984. However, the seedlings were depauperate, blooming at only 3 inches in height. Since this species is an annual, the seedlings died shortly after bloom.

In our trials, this species germinated as would a typical annual, but growth was never strong after germination. Further testing

should provide more information on whether this member of the Scrophulariaceae also needs a host plant for proper growth despite the fact that it is an annual.

Astragalus robbinsii (Oakes) Gray var. *jesupi* Egglest.

Germination from seed collected in July was very poor when sown immediately after collection. A three-month period of moist cold on this same trial did not increase seed germination significantly. However, seed stored in dry cold in the refrigerator and sown outside in November resulted in over 50% germination the following spring (46 seeds sown). Mortality of these seedlings was high, probably due to improper drainage in the soil mix after the seedlings were potted.

It is likely that this species, like many Leguminosae (Young and Young, 1986) has a hard seed coat and that the freezing and thawing over winter enable the seed to take up water and germinate in the spring. It is possible that overnight soaking in water or scarification followed by moist, cold refrigeration would give good results. The problems of mortality of plants after germination can probably be overcome by treating the plants to a more well-drained soil mixture.

Polemonium van-bruntiae Britt.

Seed of this species did not germinate well immediately after collection from the wild in August, 1986, either with or without a period of moist cold (Prop. #86p-786 and 86p-548). However, the same seed when held dry under refrigeration from September, 1986 until sowing outside in April, 1987 germinated very well. In other tests with this same seed, germination has been erratic, but seed held dry under refrigeration until sowing outside in November, 1987 germinated extremely well.

Although other species of *Polemonium,* including *caeruleum,* have typically germinated at GITW without cold treatment, this variety does seem to germinate better after a period of moist cold. However, results in several trials have been erratic. This variety bloomed during its second year of growth.

Mimulus ringens L. var. *colpophilus* Fern.

Seed of this species needs no pretreatment for germination, but germination may be better if the tiny seed is not covered with

sand or other medium after sowing. It is not clear whether this variety is taxonomically valid, and tests are underway to establish if *ringens* var. *ringens* and *ringens* var. *colpophilus* show the differing growth habits that appear in the wild when grown together under identical conditions in cultivation. Plants bloomed during their second growing season.

Scirpus longii Fern.

Seed collected in June, 1987 and sown within two weeks of collection (no covering on top of the seed after sowing) germinated 34% within 3 months (50 seeds sown). The same seed given a cold treatment did not germinate as well. The seedlings quickly grow to a robust size and container growing has been very successfully to this point.

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